

NICARAGUA
ARAP
Agriculture Reconstruction Assistance
Program

Market Survey
CENTRAL AMERICAN ETHNIC FOODS AND MARKET LINKAGES
SURVEY OF SOUTH FLORIDA

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MARKET SURVEY: CENTRAL AMERICAN ETHNIC FOODS AND MARKET LINKAGES SURVEY OF SOUTH FLORIDA

INTRODUCTION

The stated objective of this project is in line with the ARAP wishes to contribute to the development of agribusiness in Nicaragua through the identification of market opportunities that exist in the area of ethnic and niche market foods that appeal to Central American and Nicaraguan groups in the United States.

In keeping with the ARAP objective to develop agribusiness in Nicaragua through the identification of identification of market opportunities that exist in the area of ethnic and niche market foods that appeal to Central American and Nicaraguan groups in the United States. A list of products was developed to reflect areas of market opportunity in South Florida. The primary target market for these products is the United States population of Central American origin in Miami and other cities. The US Bureau of the Census reported the 1999 Hispanic population of Miami at 1,249,358. The Nicaraguan American Chamber of Commerce estimates the Nicaraguan population of Miami at twelve and one half percent of the total Hispanic population, or 156,169 people. Other US areas of large Central American population are Los Angeles California and Washington DC [mostly Salvadorans]

The product list was modified after visiting local markets around the area of Sweetwater near 107 Ave. in Miami. Miami has 635 markets and supermarkets not including wholesale markets and distributors. Within a ten mile range of Sweetwater 270 local markets were identified. These markets include 152 Hispanic markets.

In light of more than twenty years of experience with Central American production both as a buyer and producer, grower/shipper, and marketing experience in the US several important points come to mind.

Hispanic Foods

Currently Central American and Caribbean dishes are enjoying great popularity on US tables. Authenticity makes substitution of ingredients difficult. Staple food items in the US market like tortillas are inferior to tortillas available in Central America.

The tortilla segment is the largest growth area for US bakeries at present. Tortillas are

the right product at the right time and spin offs like wraps enable this product to cross over to mainstream markets. The following article illustrates what can happen with a Central American or Hispanic product that finds increasing demand both through increased market size and creative marketing and promotion.

Ten to twenty years ago few people would have expected that tortillas would become a staple item for all US consumers. The following information shows the impact of tortillas both wheat and corn on the US bakery industry.

The tortilla Industry Association released the following information in 1999:

TORTILLA CONSUMPTION CONTINUES TO GROW IN US AND ABROAD

Results Reveal Global Market Reached \$6 Billion in 1998 With Additional Growth In Sight

DALLAS, TX The Tortilla Industry Association (TIA) today announced the findings of a market research study, which confirms the tortilla's standing as the fastest growing segment of the baking industry worldwide, with global sales estimated at more than \$6 billion in 1998.

Specifically, the survey revealed North American and European tortilla markets continued growth in 1998, with sales surpassing \$3.5 billion, and projects sales to reach more than \$5.5 billion in the next five years.

Respondents to the survey indicated that, in 1998, the growth rate of corn tortilla sales surpassed that of wheat flour tortillas. However, the flour tortilla still reigns as the principal product in the industry. The study, executed by Penn and Associates based in Cleveland, Ohio, was conducted via telephone interviews with 101 North American and European tortilla manufacturers during the months of April and May 1999.

The tortilla industry is undergoing tremendous growth and expansion as we move into the new millennium, to some extent because of the growing acceptance of tortillas by all cultures," said Irwin Steinberg, executive director of the Tortilla Industry Association. "There is much new territory to explore within the industry and we are working together to develop new products and embrace our expanding customer base.

The growing popularity of tortillas is attributed to the "bread-like" acceptance of tortillas by non-Hispanic cultures. Once considered an ethnic food, the tortilla now serves as a staple-bread. Now, North American and European consumers recognize the versatility of cooking with tortillas and choose to include them to many of their recipes. The emergence

of wraps (recipes using flour tortillas with a wide variety of non-Hispanic fillings) helps to bridge the transition of tortillas from primarily ethnic recipes to mainstream dishes.

In addition, the study also highlights increased consumer awareness due to more advertising, the development of flavored tortillas, and expanded shelf space as trends responsible for market growth.

The Tortilla Industry Association is a not-for-profit organization founded in 1990 to assist companies in the tortilla industry in management, education and product promotion activities. For more information about the Tortilla Industry Association, please visit the Web site at www.tortilla-info.com.

Opportunities

Opportunity develops in areas where there is greater risk, with new crops and products that have great potential for demand. Occasionally these products find increasing demand for their product and very high prices for a few short years. As the popularity becomes apparent more and more players get involved. More and more producers find out ways to produce a high quality product and volumes increase. Eventually the market becomes over supplied, the market expands because more consumers purchase the product at lower prices. The economics of scale change. Margins are smaller, competition is greater, and everything becomes tighter. When chain supermarkets begin to feature and support the product, the market expands even more. When the prices drop, only the best and strongest producers survive.

Assumptions

The assumptions that many growers have prior to investigation is that it will be cheaper to produce in Central America. When all the costs are factored in, it becomes clear that indeed almost all crops cost much more to produce in Central America. The assumption that lower labor costs result in lower production costs is false. Often labor costs translate to less than 1% of the product C.I.F. (cost insurance and freight). The total infrastructure needed to successfully export from Central America is complex and further complicated by the lack of reliable supplies of inputs at the production source. Central American weather also proves to be very much of a challenge. Rainfall may be as much as two meters each season. Hurricane MITCH produced more than 58 inches during the three days it affected Honduras and Nicaragua. Insect and disease cycles are often not interrupted by seasonal changes. When crops are not available, insects go to other plants, weeds, ornamentals, and continue to maintain high populations. In many cases native plants and species that survive well in tropical environments of

Central America make better business opportunities. There is no cold spell to break the damaging insect and disease cycles.

In other regions of the world many of the perishable vegetable crops are produced in arid

production areas where rainfall is less than three inches, (ten centimeters), and where insects and diseases are less of a problem. Central American countries often receive rainfall of as much as two meters or more. The advantage of perishable crops is the market clearing function afforded by perishability. No matter how much product in the supply chain, it will change either because the product is consumed or because it has spoiled.

Root crops such as malanga are produced in volume year round in Florida. Often the only real opportunity for exporting this product is when Florida production is damaged by cold or flooding. It is not safe to build a production and export program on the assumption that US production will fail or that inclement weather will result in more favorable prices. Other tubers such as yuca are already produced and exported in such large volumes from Costa Rica that profit margins are extremely low. If only one trailer is lost due to road hazards, it may take as much as the profit from ten trailers to break even on the loss.

Processed, canned, or frozen products do not enjoy the market clearing function of fresh, perishable crops. Demand for canned products is much less than for fresh. Margins are as low as 2% for frozen products.

The profit margins on processed, frozen, canned products are very low. Many of the processed products examined in this study have a shelf life of one year or more. The market does not clear because the production is not perishable. Although all of the processed products listed and examined are currently produced in Nicaragua, they are also all already being successfully exported to the US.

If the target market for canned products is solely the Nicaraguan population of Miami and Houston, the market for certain products like pickles and hot sauces is extremely small and already supplied. Nicaraguan immigrants seem to be willing to pay high prices to have the Nicaraguan brands on their tables, but this phenomenon may lessen with the second generation immigrants. Crossover to US markets has occurred with certain products like Habanero sauce from Belize.

In the US canned products like catsup that can be found in every household represent less than three dollars per person per year. Applying the same standard to Central American brands of pickles for Central American consumers we are looking at less than three hundred thousand dollars total per year at less than two percent profit. An all inclusive overview of the project demands an objective evaluation of the target markets, economic level of consumers and product utilization.

All of the products examined are currently supplied to Hispanic consumers from Central and South America. The types of companies exporting are strong diversified companies that can survive the storms of oversupply and weak prices. Any production or transport disadvantage becomes magnified when market conditions weaken. The pull through function of the US market is built on demand and availability. Chain stores depend on a reliable supply of the product to maintain store space throughout the marketing system.

If the store space is lost to competing products, it may take as much as two years to regain the market space.

Shelf Space

An illustration of this principle occurred about sixteen years ago with orange juice production. Many people assume that orange juice is a mandatory part of the US breakfast. During this particular marketing season extreme cold damaged orange production and killed many of the trees in the northernmost production areas in Florida. For a short time the existing supplies of orange juice found very high prices, but soon supplies were exhausted. Orange juice was not available and competing products began to occupy the chain store shelf space. Florida orange juice lost its shelf space to competing products. It took more than one year to regain the lost space.

The growers soon after became involved in Brazilian orange and orange juice production to assure that store level shelf space would not be lost for lack of juice supplies. The production and export business is not based on only exporting when prices are high. Packing quality should remain constant so that consumers will always have a choice of the best product possible. This will increase demand over time. Branding and brand recognition seems to be becoming more popular especially with regard to products like sweet onions.

Chain store support

One of the avenues to survive and prosper in exports is to secure chain store support for the product. One of the sweet onion exporters from Nicaragua was able to develop a high quality product and to achieve market support from one of the strong chains in the west and Midwest. The deal was made possible because the grower made contact with a reliable producer of sweet onions in the southern

US and increased the months of availability through additional supplies available from Nicaragua.

Inland Freight Disadvantage

With regard to Nicaragua transport costs are very significant. Because Nicaragua has no port with adequate access roads and port infrastructure to handle export programs, all export production has to be hauled over land either to Costa Rica or to Honduras. This added overland transport causes apparent and hidden costs. The apparent cost is one thousand US dollars per trailer inland freight. The hidden costs are damage to the product due to poor roads, increased risk to the product through exposure to increased hazards, and lost time. Lost time could result in much lower prices.

All of these factors result in greater opportunities for the best and most efficient growers because others will not be able to compete, and increased incentives for growers to focus and demand the best and most efficient production practices. It is already very apparent that labor costs are only a very small portion of the total exported product cost. It is not wise to hold back in the area of local compensation for labor. The grower must be involved with well paid, well motivated production and packing personnel. The grower should be aware at all times of the significant areas of risk exposure for his crops. Although local market support can help the export deal at least to help cover transport costs, local markets are easily oversupplied and can only account for small amounts of product.

US consumption of fruits and vegetables increasing at 2.4 percent per year. This is from: **Agricultural Baseline Projections to 2009.** World Agricultural Outlook Board, Office of the Chief Economist, US Department of Agriculture. Prepared by the Interagency Agricultural Projections Committee. Staff Report No. WAOB-2000-1, February 2000.

The current study looks for options for Nicaraguan producers to take advantage of the increasing demand for Central American and Caribbean products in US markets both amongst Hispanics and the mainstream markets.

PRODUCT LIST for this study

Many of the products listed for this study are products with low profit margins. The current product as of this writing is as follows:

Ethnic and niche products

Processed products: frozen or canned

Passion fruit, (Granada, parchita, paracha, maracuya), mango, papaya, guava, pineapple, pitahaya, cashew apple, pickled peppers, chileros, picante sauce, almibares (syrops), cajeta,

Dairy

Cheese, cuajada en hoja, cuajada ahumada, queso seco, queso crema.

Meat

Central American cuts, costilla, lomo, lomillo, sesina, posta,

Fresh products

Montelirio pineapple, (white pineapples), plantains, and Hawaiian plantains, tropical roots and tubers quequisque,

Receivers/brokers/ food service products

Fresh produce

Okra, baby corn, sweet corn, watermelon, hard squash, sweet onions, ginger

Market search site visits Nov. 1-4

On 04 November 2000, a group of Nicaraguan producers and APENN coordinators were lead by Ricardo Frohmader to meet with William Hubbell in

Areas of Interest

Miami to visit local markets and get first hand information of the market size and characteristics. Several areas of interest were identified as follows:

1. Existing suppliers that are supplying the local needs of the Nicaraguan and central American consumers in South Florida. Most of the market demands are being covered with a large selection of Nicaraguan products offered to the consumer.
2. Wholesale markets and terminal market suppliers that buy direct from Central American producers. These are natural outlets for root waxed root crop production. Please note that many of the root crops are being grown locally in Homestead for the large Cuban market.
3. Restaurants and food service suppliers and users of all of the products on the list. These needs are currently supplied piece meal through the Miami Terminal market.

All of the visits originated at the Courtyard Marriott, 3929 NW 79 Ave., in Miami.

The first day of visits was initiated by Ronald Lacayo who visited the group for more than four hours. He is a Miami based entrepreneur currently in the fritanga restaurant business in Miami. Fritangas are Hispanic style fast food restaurants that typically have pre cooked casseroles and native dishes prepared, ready to eat for consumers. These restaurants are found all over Central and South America, as well as in Miami. These restaurants are frequented by Central Americans, and Hispanics in the Miami area. Ronald listed more than twenty of these local restaurants that use all of the products on the supply list. Ronald especially mentioned a high demand for beef products to supply demand for the central American cuts not available in the US. He proposed that the suppliers organize to create a distribution/supply system for the fritanga trade.

A program to supply the fritanga market for Miami would involve a consolidation system in Managua and a distribution system in Miami. The shipments would satisfy confirmed Miami orders for all of the products listed. The areas of opportunity are areas that have not been developed and would involve much investment and development time.

Market demand

Ronald demonstrated that there is a strong demand for Nicaraguan products throughout Miami. In Central America families are accustomed to spend one half or more of their disposable income to eat. Now that they are in Miami and much

better paid, they are willing to pay fair prices for food cooked the way Mama used to make it.

Consumer profile

These consumers are primarily blue collar workers making minimum wage or better more than ten times more than they would make in Nicaragua they are willing to pay much more for food, but not high prices by US standards. However they are disposed to pay premium prices for Nicaraguan products especially at festival times and religious holidays. The only way to prepare authentic Central American food is to use authentic Central American ingredients.

Meats

US cuts of meat are not equivalent to Central American cuts and the meat has a different flavor. There is a good demand for Central American cuts of meat within the Nicaraguan community. The assumption that Ronald was making is that meat purchased in Nicaragua and shipped froze to Miami would be reasonably prices. A thorough analysis of export costs and landed prices is necessary.

The success of the Nicaraguan style fritanga is the production of authentic Nicaraguan cooking using authentic flavors, spices, ambiance, and pricing.

Ronald explained that there is a definite demand to supply these authentic supplies and ingredients for the fritanga trade in Miami.

Fritanga Supply System

A local Miami warehouse will be needed that can consolidate all of the products for the restaurants that will pick up, or receive the merchandise they have ordered.

Ronald suggested that there are currently wholesale suppliers that are able to deliver most of the processed, canned and frozen products needed by the local

restaurant trade such as Jetro. He mentioned that they could use as much as 1,000 cases of beef per week.

Crystal Valley Foods

After Ronald Lacayo's presentation in the Hotel a visit was made to Crystal Valley Foods. Tim Ryan with Crystal Valley Foods has more than 20 years experience in the off shore counter season produce deal. His company specializes in asparagus, snopeas, solo papayas, mangos from Brazil and Peru, and tropical fruits. They supply wholesalers, food service and supermarkets. Tim explained that each year the producers become more intelligent and the competition becomes stiffer. Margins that were once large become small and require more input and investment.

Jetro Cash and Carry

Next a visit was made to Jetro Cash and Carry Distributors in the terminal market area of Miami. Henry Castillo a produce supply and export manager from Nicaragua showed interest in all the products on our list. Jetro handles all the fruit pulps, frozen, fish, meats spices, and fruits needed for restaurant supplies except the full line of cheeses.

Jetro is a SAMS club style store for consumers and small business ideal for fritanga and small restaurant supply that can deliver same day due to ready supplies. This supplier, a division of Restaurant Depot is supplying all of the needs for the local small restaurants and fritangas in the Miami area and would seem to invalidate the business opportunity for a similar supply chain.

Fritanga Moralimpia

Next a visit was made to Fritanga Moralimpia, Ronald Lacayo's restaurant. A first hand sampling of many typical Nicaraguan dishes was available. A subsequent tour of the area including Flagler and Sweetwater demonstrated that there is authentic Nicaraguan culture right in the heart of Sweetwater. There are hundreds of small stores and markets that carry almost every type of Nicaraguan food product known from nacatamales to rosquillas. Within ten miles of Sweetwater there are more than 300 food stores and supermarkets most of which are Hispanic. This and Calle 8 are the first areas inhabited by immigrants with limited resources. As people become more successful they move to Fontainebleau and points north.

Genaro Produce

On the next day Genaro Aragón at 1200 NW 22 St. #71-90 in the Miami wholesale terminal market was visited. Genaro is a knowledgeable player in the produce business and two years ago started his own produce supply business. He is a native Nicaraguan entrepreneur having worked for more than fifteen

years in the Miami market. He is definitely interested in working some of the root crops through his warehouse.

Market News Service

Next a visit to Jim Cunningham with USDA Market News Service at 909 SE 1st Ave. Miami, FL was most informative. Jim Cunningham was very helpful and explained all of the information available over the Internet.

Jim explained the actual supply situation with sweet onions to illustrate one of the possible market situations that cyclically occur in the produce deal. During the 1999 season the sweet onion market was oversupplied by overzealous producers worldwide trying to capitalize on the increased demand for sweet onions. Several supermarket chains had decided to feature sweet onions year round.

1999 Sweet Onion Situation

The market was oversupplied and prices were very low. Low prices translated to more purchased of sweet onions than ever before which drastically increased the number of consumers purchasing sweet onions weekly.

Result of low market

Because of low prices fewer producers planted for the 2000 season. The current market has great demand with low supplies and high prices. In ideal situation would keep prices low enough to increase market expansion and demand and high enough to maintain profitability at the grower level. This seldom happens. In order to take advantage of the best prices the grower has to commit to a long view and stay in the market on a year to year basis.

Most of the prices and the weekly arrival market outlook reports are available at the following website:

www.ams.usda.gov/fv/mncls/terminal.htm

A typical report is included

Market Report, USDA Market News Service format

MIAMI Terminal Prices as of 17-JAN-2001 Provided by: Fruit and Vegetable Market News, Federal-State Market News Service, USDA. Phone: (305) 373-2955 Fax: (305) 373-3562 partly cloudy 65-79 MISC. TROPICAL FRUIT AND VEG ---ALOE LEAVES: ctns FL 7.75-8.40 occ lower ---BATATAS: 50 lb sks FL med-lge 28.00-30.00 mostly 29.00-30.00 occ lower ---BITTER ORANGE: 40 lb ctns FL 7.00-9.00 40 lb mshsks DR 8.00 ---BREADFRUIT: 45 lb sks DR 23.00 ---CALABAZA: 50 lb sks HT 14.00 PN 9.00-10.00 mostly 9.00 some low as 6.50 ---CHAYOTE: 20 lb ctns CR 3.75-5.50 occ lower 40 lb ctns CR 8.35-10.00 mostly 9.00 ---COCONUTS: 50 lb sks DR 40s 11.25-13.00 mostly 11.50-12.50 50s 11.25-13.00 mostly 11.50-12.50 ---DASHEEN: 50 lb ctns JM 42.00 ---GINGER ROOT: 30 lb ctns CQ 24.00 CR 17.00-18.00 mostly 18.00 few 22.00 some low as 15.40 ---JICAMA: 20 lb ctns CA 12.00-13.00 ---MALANGA: 40 lb ctns CR Blanca 28.50-32.00 mostly 29.00 few 36.00 occ lower Eddoes 14.00 Islana 19.00 Lila 38.00-39.00 mostly 38.00 some 36.00-37.00 ---SUGARCANE: 50 lb bndls FL bchd 10s 6.00-7.00 occ higher ---TOMATILLOS: 10 lb ctns MX 10.00-14.00 mostly 10.00 ctns/crts FL 23.00-24.00 occ lower ---YAMPI: OFFERINGS INSUFFICIENT TO QUOTE ---YAMS (NAMES): 50 lb ctns CB Blanca 19.00-20.00 CR Blanca 14.50-16.00 mostly 14.50-15.00 few 17.00 JM Yellow 32.00 occ higher and lower ---YUCA (CASSAVA): WAXED 40 lb ctns CR 12.00-13.00 mostly 12.00

Daily US market information available to Nicaraguan producers

The APENN representatives and the growers were able to see that they can get next day market analysis and arrival information as a free service.

Transnica

During the afternoon Transnica International Freight forwarders were visited the president was not available due to a personal emergency, but her brother and

founder Ivan was able to provide much information for exports into the US. He said that they are currently handling more than one million pounds of cheese mostly queso seco through the Miami airport. Most of their freight is through UPS/Challenge Air. Challenge has been one of the leaders in the Central and South American air freight deal during the past twenty years.

Orrin Cope produce, okra

Next a visit was made to Homestead to Orrin Cope produce okra producers. They were open to developing a trust relationship with Nicaraguan okra exporters that could pick and pack the quality needed for the US market.

We found that there is an opportunity is for an individual shipper to build a mutual trust relationship with existing suppliers in the Miami supply market system.

Value Added

There is a value added market for already prepared and frozen plantains. The frozen cooked green plantains in the local market are not very appetizing, but the cooked fried maduros are exceptionally good and are features at all of the POLLO Tropical restaurants. The ripe plantains are harvested and prepared in Honduras, shipped frozen to the US and thawed and heated in the restaurants.

Antojos

There are large groups of Nicaraguan immigrants that will pay extra for Nicaraguan style products in the Miami market. In the stores visited by the visiting Nicaraguan group we found every product from Nicaragua available to consumers including soft drinks. Although many of the products seen are processed, pickled or canned, many fresh products were also available. Most of the cuajada en hoja is produced in the Miami area and made to look exactly like the fresh cheese available in Nicaragua.

The program to supply the fritanga market for Miami would involve a consolidation system in Managua and a distribution system in Miami. The shipments would satisfy confirmed Miami orders for all of the products listed. The areas of opportunity are areas that have not been developed and involve much investment and development time.

Economy of scale.

At this stage of project development the learning curve is large for this project. Volumes should be kept small so that lessons can be learned with lower costs.

Volumes: First stage development demands a current assessment of the market needs in the US target market(s). Each product has it's own requirements for

storage, handling, and shipping. Loads can be consolidated in Nicaragua by frozen/processed, perishable refrigerated, and non perishable.

Consumers

There are more than 500,000 Nicaraguans in the US, and they do have a definite preference for Nicaraguan products. Many of the restaurants visited offer lunch to their patrons for 2 to \$4.00 per person. Selections include chicharones, ropa vieja, hilachas, refrescos naturales, maduros, gallo pinto, quequisque, and all of the products on our list.

If the normal supply chain for these products were used, through importer, wholesaler, and restaurant, there would be no profit left for the restaurant owner.

Market side:

A Customs Clearance bundle of services including Customs broker, Paperwork, Receiving, storage, distribution, billing, payments will be needed including a local Miami warehouse that can consolidate all of the products for the restaurants that will pick up, or receive the merchandise they have ordered.

OPPORTUNITIES AND SPECIFICATIONS BY PRODUCT

The following analysis deals with the market opportunities for each product listed. Market standards for processed products are included to allow for best fit for products produced in Nicaragua. A detailed description of some of the processed products is included to easily determine supply possibilities that already exist in Nicaragua.

Canned Products in the US are usually of less value than fresh. However in the Central American countries canned products are often more expensive and considered value added products such as pickles, sauces and condiments. Items like canned peas are often used to garnish prepared dishes.

Product specifications and information:

Ethnic and niche products, Processed,
Passion Fruit, Granadilla, Parcha, Parchita.

The following information was obtained from

Dole Europe <http://www.doleeurope.com/products/fruits/passion-d.ht>

<http://www.thrtropicalsource.com/index.shtml>

The principal production areas and seasons for this product are as follows:

Country Peak Harvest Season

Brazil November - February

Colombia March - June

Peru March - June

Ecuador March - September

Passion Fruit Production by Country in metric tons

Colombia	30000	Africa	10000
Ecuador	85000	Australia/Nz	10000
Peru	15000	Hawaii	1000
Brazil	450000	Asia	19000
Central/So.Am	20000		

The product is used in hundreds of fruit juice blends and soft drinks. Total usage in the US is approximately at three thousand tons per year of processed pulp.

VARIETIES & ORIGINS

(see) http://www.doleeurope.com/products/fruits/passion_d.html

<http://www.thetropicalsource.com/index.shtml>

There are two commercially grown varieties: the purple and yellow. Most of the production is of the yellow variety. The purple variety is grown in the US, Kenya and Australia.

The California Rare Fruit Growers Association lists the following information about cultivars and production of Passion fruit.

PASSION FRUIT

Passiflora edulis / *P. edulis flavicarpa*

Passifloraceae

Common Names: Passion Fruit, Granadilla, Purple Granadilla, Yellow Passion Fruit

Related Species: Fragrant Granadilla (*Passiflora alata*), Red Granadilla (*P. coccinea*), Maypop (*P. incarnata*), Yellow Granadilla (*P. Laurifolia*), Sweet

Granadilla (*P. ligularis*), Sweet Calabash (*P. maliformis*), Banana Passion Fruit (*P. mollissima*), Giant Granadilla (*P. quadrangularis*).

Origin: The purple passion fruit is native from southern Brazil through Paraguay to northern Argentina. It has been stated that the yellow form is of unknown origin, or perhaps native to the Amazon region of Brazil.

In Australia the purple passion fruit was flourishing and partially naturalized in coastal areas of Queensland before 1900. In Hawaii, seeds of the purple passion fruit, brought from Australia, were first planted in 1880 and the vine came to be popular in home gardens.

Adaptation: The purple passion fruit is subtropical and prefers a frost-free climate. However, there are cultivars that can take temperatures into the upper 20's (°F) without serious damage. The plant is widely grown in California as far north as San Jose, the Monterey Bay Area and the San Francisco Bay Area. The vines may lose some of their leaves in cool winters. The roots often resprout even if the top is killed. The plant does not grow well in intense summer heat.

The yellow passion fruit is tropical or near-tropical and is much more intolerant of frost. Both forms need protection from the wind. Generally, annual rainfall should be at least 35 inches.

DESCRIPTION

Growth Habit: The passion fruit is a vigorous, climbing vine that clings by tendrils to almost any support. It can grow 15 to 20 ft. per year once established and must have strong support. It is generally short-lived (5 to 7 years).

Foliage: The evergreen leaves of passion fruit are alternate, deeply 3-lobed when mature and finely toothed. They are 3 to 8 inches long, deep green and glossy above, paler and dull beneath and, like the young stems and tendrils, tinged with red or purple, specially in the yellow form.

Purple passion fruit is self-pollinated, but pollination is best under humid conditions. The flowers of the yellow form are perfect but self-sterile.

Carpenter bees are the most efficient pollinator, much more so than honey bees. Wind is ineffective because of the heaviness and stickiness of the pollen.

Fruit: The nearly round or ovoid fruit, 1-1/2 to 3 inches wide, has a tough rind that is smooth and waxy and ranging in hue from dark purple with faint, fine white specks, to light yellow or pumpkin-color. Within is a cavity more or less filled with an aromatic mass of double walled, membranous sacs containing

orange-colored, pulpy juice and as many as 250 small, hard, dark brown or black, pitted seeds. The unique flavor is appealing, musky, guava-like and sweet/tart to tart. The yellow form has generally larger fruit than the purple, but the pulp of the purple is less acid, richer in aroma and flavor, and has a higher proportion of juice (35-38%). Numerous hybrids have been made between purple and the yellow passion fruit, often yielding colors and other characteristic intermediate between the two forms. The vine, especially the yellow form, is fast-growing and will begin to bear in 1 to 3 years. Ripening occurs 70 to 80 days after pollination.

CULTURE

Location: Plant passion fruit vines in full sun except in very hot areas where partial shade is preferable. The vine can be rather rampant, so it is important to plant it next to a chain link fence or install a strong trellis before planting. The plants can also be trained into an attractive arbor.

Soil: Passion fruit vines grow on many soil types but light to heavy sandy loams with a pH of 6.5 to 7.5 are the most suitable. Excellent drainage is absolutely necessary. Also, the soil should be rich in organic matter and low in salts. If the soil is too acid, lime must be applied. Because the vines are shallow-rooted, they will benefit from a thick layer of organic mulch.

Irrigation: Regular watering will keep a vine flowering and fruiting almost continuously. Water requirement is high when fruits are approaching maturity. If the soil is dry, fruits may shrivel and fall prematurely.

Fertilization: Passion fruit vines are vigorous growers and require regular fertilizing. A good choice is 10-5-20 NPK applied at the rate of 3 pounds per plant 4 times a year. Too much nitrogen results in vigorous foliage growth at the expense of flowering. Passion fruit vines should always be watched for deficiencies, particularly in potassium and calcium, and of less importance, magnesium. Plants that have been damaged by frost should receive a generous fertilizing after the weather has warmed

Pruning: Pruning is necessary to keep the vines within bounds, to make harvest easier and to keep the plants productive by maintaining vigorous growth. In warm winter climates prune immediately after harvest. In areas with cool winters prune in early spring. As a general rule remove all weak growth and cut back vigorous growth by at least one third. In very hot climates allow a thick canopy of foliage to grow around the fruit to prevent sunburn.

Frost Protection: Because of their mass, passion fruit vines are difficult to cover when freezes threaten, but the layers of leaves help protect the inner branches from frost damage. The plant will also usually come back even when frozen to the ground. The best strategy is to grow the vines against a wall or deck or in a patio. Any kind of overhead protection provides additional benefits.

Propagation: Passion fruit vines are usually grown from seeds. With the yellow form seedling variation provides cross-pollination and helps overcome the problem of self-sterility. Seed planted soon after removal from the fruit will germinate in 10 to 20 days. Cleaned and stored seeds have a lower and slower rate of germination. Seeds should be planted 1/2 to 1 inch deep in beds, and seedlings may be transplanted when 10 inches high. If taller (up to 3 feet), the tops should be cut back and the plants heavily watered.

Plants can also be propagated by layers or cuttings of matured wood with 3 to 4 nodes. Rooting may be hastened by hormone treatment. Cuttings should be well rooted and ready for setting out in 90 days. Grafting is an important means of perpetuating hybrids and reducing nematode damage and diseases by utilizing the resistant yellow passion fruit rootstock. Scions of healthy young plants are grafted to seedlings, making sure the diameter of the scion matches that of the rootstock. Either a cleft graft, whip graft or side-wedge graft may be made. **Pests and Diseases:** In tropical areas passion fruit vines are attacked by a host of pests and diseases. In these areas the purple passion fruit is particularly susceptible to nematodes, while the yellow passion fruit is more nematode resistant. In California the problems are much less severe, although the plants can be afflicted with nematodes and viruses as well as Fusarium and other diseases that thrive in cool soils. Nematodes are partially responsible for the short life of many passion fruit vines. Snails can also be a serious problem in California, often completely stripping a vine of leaves and bark, killing young plants or predisposing them to disease.

Harvest: The fruit will quickly turn from green to deep purple (or yellow) when ripe and then fall to the ground within a few days. They can either be picked when they change color or gathered from the ground each day. To store passion fruit, wash and dry them gently and place them in bags. They should last 2 to 3 weeks at 50° F. The fruit is sweetest when slightly shriveled. Both the fruit and the juice freeze well. The flavor of passion fruit blends well with citrus and many other fruit flavors, and is quickly appreciated by many people as they become familiar with it.

CULTIVARS

Purple form

Black Knight

Developed in Massachusetts for pot culture by Patrick Worley. Fragrant, dark purple-black fruit, the size and shape of large egg. Flavor excellent.

Vigorous, compact vine, self-fertile, very fruitful. Handsome glossy foliage. Excellent for containers.

Edgehill

Originated in Vista, Calif. Similar to Black Knight, but more vigorous,

larger growing and with larger purple fruit. One of the best outdoor cultivars for Southern California.

Frederick

Originated in Lincoln Acres, Calif. by Patrick Worley. Kahuna X Brazilian Golden. Large, nearly oval fruit, greenish-purple with reddish cast. Slightly tart flavor. Good for eating out of hand, excellent for juicing. Extremely vigorous, self-fruitful vine. Very productive, more compact than

Passion fruit varieties continued..,

P. edulis flavicarpa.

Kahuna

Very large, medium purple fruit. Sweet, subacid flavor. Good for juicing. Vigorous, productive self-fertile vine. Produces over a long season. Large, attractive foliage.

Paul Ecke

Originated in Encinitas, Calif. Medium-sized purple fruit of very good quality. Suitable for juicing and eating out of hand. Compact, very productive vine.

Purple Giant

Very large fruit, dark purple when mature.

Red Rover

Originated in Lincoln Acres, Calif. by Patrick Worley. Kahuna X Brazilian Golden. Medium to large, roundish fruit. Rind an attractive clear red color. Sweet, notably rich flavor with tart overtones,. Good for eating out of hand or juicing. Vine very vigorous, compact and self-fertile.

Yellow form

Brazilian Golden

Large, golden-yellow fruits, larger than standard forms. Flavor somewhat tart. Extremely vigorous vine, requiring cross-pollination. Extra large, fragrant flowers, white with a dark center, blooming during mid-summer. Produces one large crop beginning in late August or early September.

Golden Giant

DEMAND IN THE US

Reliable statistics are not available on passion fruit imports but a current estimate is as follows

Ecuador	2,650,000 lbs.
Brazil	1,750,000 lbs.
Peru	750,000 lbs.
Columbia	750,000 lbs.
Others	<u>100,000 lbs</u>
Total	6,000,000 lbs.

Yield from fresh to processed fruit:

The yield for processing one metric ton (2204 lbs..) of 50 brix concentrate is twelve to one. In other words, it takes 12 kg of fruit to make 1 kg of concentrate. About two thirds of the bulk is refuse of which 90% is rind and 10% is seeds.

Mango

The popularity of mango has increased dramatically in the past few years as consumers search for new and different healthy taste sensations and food manufacturers attempt to satisfy these needs. There are many varieties of mango grown all around the world. Most are consumed as fresh fruit but we have seen a great increase in popularity of mango used in processed foods. (Ice Cream)

Varieties of mango have a broad range of colors, flavors, origins, and seasons. They are all relatively high in potassium, Beta-carotene and vitamin C and low in fat and sodium.

Flavor profiles of mango vary but all are sweet to slightly acidic and fruity. Mango blends well with other fruits and mango is an increasingly popular ingredient in beverages, yogurts, ice creams, baking, and specialty sauces. At any one time, ITI may carry as many as five to ten different varieties of mango in purees, concentrates, and individually frozen cubes.

Less than 1% of all Mango flowers produce fruit and the mango tree produces a good crop only every other year.

* Note that criollo varieties of mango produce much better yields of processed product

than commercial varieties. It would be wise to fully investigate availability of criole yellow varieties in any area where processing might be considered.

On their web page Juan Carlos Barillas of Delicia, S.A. of Guatemala, C.A. mentions that the best quality and brix yield comes from the smaller, high fiber, native varieties in Guatemala. He says:

“the native varieties of mango have a natural brix percentage of 20 to 22 . Its natural pH varies from 4.0 to 4.2, making its acidification unnecessary. These characteristics allow us to offer the world-market a unique 100% mango puree, with an intense orange color and exquisitely deep aroma. Our aseptic puree from "Criollo" mangoes is produced during the months of May, June and July.

Our Company, Delicia, S.A. launched its operations in 1980. We are a company dedicated to growing and exporting mangoes, an exotic fruit that is well-known around the world. In order to integrate our enterprise, we began by establishing a mango plantation.

Our fruit is exported partly fresh, although a greater segment is processed into an aseptic mango puree. All the fruit we process comes from farmers that we supervise.

Throughout the years we have selected the best producers, as well as the best areas of the country to control and advance fruit harvest. Our farm is located in Guazacapán, Santa Rosa, 130 kilometers south-west from Guatemala City, and our processing and packing plant is located only 22 kilometers from Guatemala City.

Through the years we have selected the best varieties of fruit for the processing and production of mango puree. Our experience as mango growers is renowned in Guatemala and Central America.

Guava

After seven years of tests, observation and selection we finally found a variety of Guava with the best qualities to be processed as a puree. The variety we chose has a purple-pink pulp and a sweet flavor, with a Brix of 9 to 11 degrees and an intense bouquet. Guava puree is processed from December through March.

Mangoes

Guatemala is a country dedicated mainly to agriculture, and enjoys a diversity of climates. In addition to the variety of mangoes internationally known, there are several varieties native to Guatemala. After years of studying and observing harvests, we chose one of these varieties, which we call "Criollo".

This type of mango indigenous to Guatemala, has excellent organoleptic qualities, distinct and unique in its kind. For example it has a natural brix of 20 to 22 degrees. However, we have been able to produce aseptic mango purees with a natural Brix of up to 28 degrees, depending on the area the fruit is grown in. Its natural pH varies from 4.0 to 4.2, making its acidification unnecessary. These characteristics allow us to offer the world-market a unique 100% mango puree, with an intense orange color and an exquisitely deep aroma. Our aseptic puree from "Criollo" mangoes is produced during the months of May, June and July."

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Product descriptions, processed, and or frozen:

Herein follows a list of processed tropical fruit pulps in the market. All of the product is packed in steel or plastic drums in an aseptic plastic liner. Some of the product is frozen and some canned as per the clients needs.

ASEPTIC CONCENTRATED MANGO PULP - 28°

PRODUCT DESCRIPTION :

100% NATURAL product, soft, NOT DILUTED OR FERMENTED, The pulp is refined through a strainer, spun, homogenized, pasteurized, packed aseptically and is frozen with no added sugar or preservatives.

Minimum Brix 28.0, 20 % of solids in suspension % of acidity from Citric Acid

PRODUCT USE AND DESCRIPTION :

Uses : Making juices, soft drinks and nectars.

DURATION OF THE PRODUCT :

Hermetically sealed at room temperature : 1 year

ASEPTIC NATURAL PLAIN GUAVA PULP

PRODUCT DESCRIPTION :

100% NATURAL product, soft, NOT DILUTED OR FERMENTED,

obtained from straining the edible part of fresh, healthy, ripe and clean guavas. The pulp is refined in a 0.5 mm strainer, spun, homogenized, pasteurized, packed and is frozen.

Minimum Brix 8.0

Pineapple, PIÑA

Product Specifications

ASEPTIC CONCENTRATED PINEAPPLE PULP

PRODUCT DESCRIPTION :

100% natural product obtained from straining fresh, clean and ripe pineapples.

SPECIFICATIONS

Brix 50 + 1.0

Dairy, Cheese, cuajada, cuajada ahumada, queso seco

Cheese

At present there is great interest in Hispanic and Caribbean cooking in the US. In the past many US chefs substituted US style cheeses such as Monterey jack for white cheeses used in Hispanic cooking. This does not work. When melting cheeses are substituted for dry non melting cheese the end result is a totally different dish. The central American cheeses do not melt when heated or cooked. there is a limited opportunity to import the dry cheeses that have a long shelf life into the US market. Apparently much of the cheese marketed in El Salvador and sent to the US is indeed produced in Nicaragua.

All of the Central American type cheeses are being manufactured in the US. Although much of the product seen during the field visits to Miami is made to look as if they were made in Nicaragua, When labels are closely examined it was observed that most all of the fresh type cheese with self life of less than one week is currently produced locally in the US.

Nevertheless dry Central American Cheeses have enough profit potential to be exported via air. These products have some of the best potential for further commercial development in US markets,

Meat

Central American cuts of beef such as mano de piedra, lomo, sesina, are not readily available in the US.

Fresh

Montelirio pineapple, (white pineapples), plantains, and Hawaiian plantains
tropical roots and tubers, quequisque, (malanga), and yuca

Due to the close proximity of the Cuban population and good growing conditions south of Miami, large amounts of malanga, and plantains are grown for the Miami market. Opportunities exist for the tubers but often only as a fill in when local production is affected by weather. A strong program would have to be developed with a local distributor to justify the additional costs of freight.

With regard to yuca the margins are less than five hundred dollars per container, and the production is dominated by large dependable supplies of Costa Rican product. Some of the Costa Rican producers are already buying in Nicaragua to supplement their own production from San Carlos.

Receivers/brokers/ food service

Fresh

okra, baby corn, sweet corn, watermelon, hard squash, sweet onions,
Others

pickled peppers, chileros, picante sauce, almibares, cajeta, ginger

Okra

One grower in Homestead showed some interest in receiving okra during the winter season. Nicaraguan producers would have to come to the US and come to an understanding to make this deal work.

Sweet Corn

Ben Littowich of Littowich produce was visited to determine the viability of sweet corn as an import to South Florida. Ben is the largest distributor of sweet corn in South Florida.

He explained that the spring and summer market is dominated by large barrel size high quality highbrids from a large area surrounding lake Okechobee. The product is

hydrocooled in wire bound crates of four dozen ears per crate. The product is very reasonably priced. The fall and winter market is dominated by large volumes of sweet corn produced in the Homestead area south of Miami. There is no opportunity for imported product due to higher production and elevated freight costs from Central America

Sweet Onions

Currently the sweet onion market is well established in south Florida with strong super market support. Publix supermarkets features sweet onions year round. The production last year was excessive causing low prices and increased market elasticity. The prices throughout 2000 were more than reasonable. As a result many consumers that would have never thought about sweet onions began to try and use them.

As a result of the low prices to growers in the previous season, many growers were not able to plant sweet onions for the current marketing season. Due to much greater consumer demand and very low supplies, current prices this season are excellent. The sweet onion market is following a trend characteristic of fresh produce crops. Some years are below break even and some years are very profitable. Only producers that can stay in production through both lean and fat years can take advantage of the profitability.

Product differentiation can provide some relief for this situation. A grower that manages to grow a sweet red onion might have some advantage for the first year or until other growers can also grow the same variety.

Produce Supply history

In the early years of the Central American melon deal some seasons resulted in prices with more that six dollars profit per box. As the profitability became obvious top some of the larger companies, more competition developed. The counter season market matured and current profitability is in the area of ten cents per box. This same pattern can be anticipated for any produce crop. Growers should understand these factors and go into deals with their eyes open.

Sweet onions are currently produced according to the following chart

Sweet Onion Production dates

January	February	March	April	May	June
Chile Peru	Chile Peru	Chile Peru	Peru	Peru	

		Texas	Texas Imperial-Tx Vidalia	Texas Imperial-Tx Vidalia	Texas Imperial-Tx Vidalia WallaWalla
	Maui	Maui	Maui	Maui	Maui
July	August	September	October	November	December
Vidalia WallaWalla Maui	WallaWalla Maui	Maui Mich.	Maui Mich.	Maui	
			28		

BUSINESS OPPORTUNITIES

The business opportunities appear in three areas as of this writing.

1. Supply existing needs of Central American consumers in the US through already established marketing systems. All of the products listed and many more are already in the market. Products in local markets include all of the canned peppers hot sauces, chileros, tamarind, fruit pulps, (Jetero) local warehouse club for Hispanic consumers and small grocers. Cheese is an excellent opportunity.

2. Supply existing needs of consumers through value added suppliers such as restaurants and fritangas.

Product differentiation

3. Differentiate products already in the system to anticipate a demand for new products not yet in the market [such as sweet red onions].

Other considerations

During the visit to Miami there was some discussion of the possibility of Electronic Pasteurization which may use electron radiation to neutralize possible objectionable pests and pathogens on fruit to be exported to the US. Since the possibility of non tariff trade barriers exist, all of the risk factors should be evaluated prior to making a large investment in electronic pasteurization.

Analysis of possibilities:

Strengths, Weaknesses, Opportunities, Threats

The products have been divided into three groups for this evaluation as follows:

Group I

Ethnic /niche products: processed
passion fruit, mango, papaya, guava, pineapple, pitahaya, cashew apple, tamarind
Dulces, cajetas, postres, almibares

Group II

Dairy, cuajada en hoja, cuajada ahumada, queso seco

Meat, costilla, lomo, lomillo, sesina, posta

Group III

Receivers/brokers/food service

Fresh

[Produce managers] Montelirio pineapple

Fresh okra, baby corn, sweet corn, watermelon, hard squash, sweet onions,

tropical roots and tubers quequisque, yuca, plantains,

Others:

[with Electronic Pasteurization]

Rambutan, Lychee, mango,

The following analysis was performed for each group.

Group I Strengths

Ethnic /niche products: processed:
passion fruit, mango, papaya, guava, pineapple, pitahaya, cashew apple, tamarindo

Dulces, cajetas, postres, almibares

1. Processed products are not subject to spoilage
2. Not exposed to time problems
3. Large growing Hispanic population of the US makes for steady, growing demand for this group of products.
4. Reliable marketing distribution system is already established.

Group I Strengths continued...

5. Immigration continues to be very important to US economy.
6. World population continues to climb making the US an attractive alternative.
7. Many of these products are already used in large volumes as ingredients for other products.
8. Restaurants are using all of these products.

Group I Weaknesses

1. The market clearing function enjoyed by perishable products does not work for these products.
2. Poor roads and increased shipping times do affect the ability to timely supply needs of buyers
3. Products that have good demand are already being supplied to the market
4. Immigrant buying trends change towards mainstream food items with second generation. Demand for these items shrinks over time.
5. High inland freight costs from Nicaragua make it very difficult for lower margin products to be profitably supplied to US markets.
6. Opportunities for mainstream crossover are limited.
7. Profit margins are low for these products.

Ethnic /niche products: processed:

passion fruit, mango, papaya, guava, pineapple, pitahaya, cashew apple, tamarindo

Dulces, cajetas, postres, almibares

Group I Opportunities

1. Immigrant population will continue to increase.
2. The popularity of fritangas that use these products will continue to increase.
3. The market is not saturated.
4. Quality standards are known.
5. All of the products can be made available
6. Source feasibility can be further evaluated.

Group I Threats

1. Continued high transportation costs will not allow a level playing field for competition.
2. Low profitability will not facilitate further development
3. Competition is stiff with large production of non perishable supplies already in supply pipeline.
4. Processing facilities are limited at source.
5. Sufficient supplies of raw materials for processing are not readily available.

Group II Strengths

Dairy, cuajada en hoja, cuajada ahumada, queso seco

Meat, costilla, lomo, lomillo, sesina, posta

(Group II Strengths)

1. Supplies are available in Nicaragua
2. Demand for less perishable forms such as queso seco is increasing.
3. US production of mainline market cheeses do not compete [they melt]
4. CA type meat cuts are not available in US market.
5. CA grass fed meats have different flavor than US meats.
6. Prices at source may be lower per head.
7. Cost of value added [slaughtering and dressing costs] is lower in Nicaragua.

Group II Weaknesses

1. Refrigerated trailer availability is much more expensive.
2. Lack of hygiene at packing facility mandates development of a HACCP program.
3. Many of the products, especially fresh cheeses are profitably produced in US and look very much like Nicaraguan product such as cuajada en hoja.
4. Market demand is not clear, currently most consumers are purchasing in US supermarkets.
5. Much of local demand is for ground beef which is readily available in US markets.

6. Entry to US markets depends on inspection where meat is packed.

Group II Opportunities

1. Electronic pasteurization would control harmful bacteria at packing plant
2. A steady supply system that brings in several consolidated trailers per week year round could work to establish and build demand.
3. Continuing interest in authentic cuisine will maintain demand for authentic ingredients.
4. High profitability of some of the products notably dry cheeses makes air transport possible and profitable.
5. Search for more products that are profitable by air.
6. Air transport is very competitive with all other CA countries as in UPS/Challenge Air with 6 flights per week.

Group II Threats

1. Any imported pathogen scare could ruin import potential
2. Consolidation of cargo creates multiple difficulties for pre clearance and customs clearance. A problem with any item on the container could hold all of the others in quarantine.
3. US landed costs will be greater than profit potential.
4. List of products profitable by air is very limited.

Group III

Receivers/brokers/food service

Fresh

[Produce managers] Montelirio pineapple

Fresh okra, baby corn, sweet corn, watermelon, hard squash, sweet onions,

tropical roots and tubers quequisque, yuca, plantains,

Others:

[with Electronic Pasteurization]

Rambutan, Lychee, mango,

Group III Strengths

1. There is a small window of opportunity for a few of the products in this group, i.e. okra.
2. Sweet onions have become mainstay in the mainstream produce markets with major chain store support such as PUBLIX in Florida, Alabama, and Georgia, and nationwide in KROGERS, and WALLMART SUPERSTORES.

Group III Weaknesses

1. Many of the products are already produced within 100 miles of the market in Homestead.
2. Only the strongest and diversified producers can survive and maintain the presence of their products in the market during the normal fluctuations of supply and demand from season to season.
3. Market potential depends on local crop production weather problems in US.

Group III Opportunities

1. Product diversification will increase demand for a new offering like sweet red onions.

2. Product spin offs create a demand for a new product not previously available such as “baby carrots”. (See Grimway Farms)
3. A well managed business committed to quality production can learn the requisite

market quality standards, produce a product at or above standards and become an open reliable producer that merits chain store support.

Group III Threats

1. Competition moves rapidly to fill market demand and diversification price spike functions are short lived.
2. Extremely large learning curve is difficult to attain at all levels necessary of farm selection , variety selection, soils, irrigation and plant nutrition management, harvest and packing, quality assurance and plant maintenance, water quality, loading and inland transportation.
3. Cash flow demands are large for initial development.
4. Poor planning causes lack of cash flow and most important inputs are not available.
5. Operating credit is mandatory from suppliers and lenders that are knowledgeable.
6. Past history of corruption and misuse of funds make financing difficult.
7. Known past performance of offshore deals makes investors unwilling to advance any funds.
8. Continued high transport costs make many deals unprofitable.

Others:

One of the topics that came up during the visit is the option of Electronic pasteurization as a treatment method to allow importation of fruits and vegetables into the US.

The process also called food irradiation is described in the following University of IOWA extension release:

Food Irradiation: What Is It?

North Central Regional Extension Publication 437

Sponsored by the Extension Services of Iowa, Nebraska, South Dakota and Wisconsin in cooperation with ES-USDA.

For copies of this publication, contact an Extension unit in one of the sponsoring states.

Revised | December 1997

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Radiation is broadly defined as energy moving through space in invisible waves. Radiant energy has differing wavelengths and degrees of power. Light, infrared heat, and microwaves are forms of radiant energy. So are the waves that bring radio and television broadcasts into our homes. Broiling and toasting use low-level radiant energy to cook food. The radiation of interest in food preservation is ionizing radiation, also known as irradiation. These shorter wavelengths are capable of damaging microorganisms such as those that contaminate food or cause food spoilage and deterioration. That capability plus the fact that much of our food supply is lost due to spoilage and insects each year is why scientists have been experimenting with irradiation as a method of food preservation since 1950. They have found irradiation to be a controlled and very predictable process.

Irradiation can be compared to pasteurization.

As in the heat pasteurization of milk, the irradiation process greatly reduces but does not eliminate all bacteria. Irradiated poultry, for example, still requires refrigeration, but would be safe longer than untreated poultry. Strawberries that have been irradiated will last two to three weeks in the refrigerator compared to only a few days for untreated berries. Irradiation complements, but does not replace, the need for proper food handling practices by producers, processors, and consumers.

Two things are needed for the irradiation process.

- 1) A source of radiant energy, and
- 2) a way to confine that energy.

For food irradiation, the sources are radioisotopes (radioactive materials) and machines that produce high-energy beams. Specially constructed containers or compartments are used to confine the beams so personnel won't be exposed. Radioisotopes are used in medical research

and therapy in many hospitals and universities. They require careful handling, tracking, and disposal. Machines that produce high-energy beams offer greater flexibility. For example, they can be turned on and off unlike the constant emission of gamma rays from radioisotopes.

What happens when food is irradiated?

Irradiation is known as a cold process. It does not significantly increase the temperature or change the physical or sensory characteristics of most foods. An irradiated apple, for example, will still be crisp and juicy. Fresh or frozen meat can be irradiated without cooking it. During irradiation, the energy waves affect unwanted-wanted organisms but are not retained in the food.

Similarly, food cooked in a microwave oven, or teeth and bones that have been X-rayed do not retain those energy waves.

What foods are irradiated?

Irradiation has been approved for many uses in about 36 countries, but only a few applications are presently used because of consumer concern and because the facilities are expensive to build.

In the United States, the Food and Drug Administration (FDA) has approved irradiation for eliminating insects from wheat, potatoes, flour, spices, tea, fruits, and vegetables. Irradiation also can be used to control sprouting and ripening. Approval was given not protect against reinfestation like insect sprays and fumigants do.

Control foodborne illness

Irradiation can be used to effectively eliminate those pathogens that cause foodborne illness, such as *Salmonella*.

All methods used to process and preserve foods have benefits and limitations. Some possible applications for irradiation with certain foods are shown in Table 1.

Table 1. Potential food irradiation uses

Type of food Effect of irradiation

Meat, poultry, Destroys pathogenic

fish organisms, such as
Salmonella, *Clostridium*
botulinum, and Trichinae

Perishable foods Delays spoilage;
retards mold growth;
reduces number of
microorganisms

Grain, fruit, Controls insect
vegetables, infestation
dehydrated
fruit, spices and
seasonings

Onions, carrots, Inhibits sprouting
potatoes, garlic, ginger

Bananas, mangos, Delays ripening
avocados, papayas
guavas, other
non-citrus fruits

Grain, dehydrated Reduces rehydration
vegetables time

What concerns are raised by opponents of food irradiation?

The term irradiation often evokes fears of nuclear radioactivity and cancer among consumers. The process seems frightening because it is powerful and invisible. Consequently, questions and concerns exist particularly about the safety or wholesomeness of irradiated food.

In December 1997, FDA approved the use of irradiation to control pathogens (disease causing micro-organisms such as *E. coli* and *Salmo-nella* species) in fresh and frozen red meats such as beef, lamb, and pork.

What are some potential applications for food irradiation?

Because the irradiation process works with both large and small quantities, it has a wide range of potential uses. For example, a single serving of poultry can be irradiated for use on a space flight. Or, a large quantity of potatoes can be treated to reduce sprouting during warehouse storage. However, irradiation cannot be used with all foods. It causes undesirable flavor changes in dairy products, for example, and it causes tissue softening in some fruits, such as peaches and nectarines. Irradiation is most useful in four areas.

Preservation

Irradiation can be used to destroy or inactivate organisms that cause spoilage and decomposition, thereby extending the shelf life of foods. It is an energy-efficient food preservation method that has several advantages over traditional canning. The resulting products are closer to the fresh state in texture, flavor, and color. Using irradiation to preserve foods requires no additional liquid, nor does it cause the loss of natural juices. Both large and small containers can be used and food can be irradiated after being packaged or frozen.

Are irradiated foods radioactive?

No, but the similarity between the two words is confusing. It is physically impossible for irradiated food to be radioactive just as your teeth are not radioactive after you've had a dental X-ray. Irradiation is radiant energy. It disappears when the energy source is removed.

Are toxic radiation products produced?

Over the past 30 years, researchers in several countries have evaluated irradiated foods for chemical products (radiolytic products) which may have formed. The toxicity of those products

has been studied also. Opponents of irradiation worry that these radiolytic products are hazardous. Biochemical and biomedical tests have not been able to identify any health problems or ill effects associated with tested radiolytic compounds.

How is food irradiation regulated?

The Food and Drug Administration (FDA) regulates all aspects of irradiation: what products it can be used on, what dose can be used, and how those products are labeled. The US Department of Agriculture (USDA) is responsible for the inspection and monitoring of irradiated meat and poultry products and for the enforcement of FDA regulations concerning those products. Since 1986, all irradiated products must carry the international symbol called a radura, which resembles a stylized flower and be labeled with the statement:

Treated with irradiation Treated by irradiation

FDA requires that both the logo and statement appear on packaged foods, bulk containers of unpackaged foods, on placards at the point of purchase (for fresh produce), and on invoices for irradiated ingredients and products sold to food processors. Processors may add information explaining why irradiation is used; for example, “treated with irradiation to inhibit spoilage” or “treated with radiation instead of chemicals to control insect infestation.”

Accurate plant records are essential to regulation because there is no way to verify or detect if a product has been irradiated, or how much radiation it has received.

Is nutritional quality reduced?

Scientists believe that irradiation produces no greater nutrient loss than what occurs in other processing methods, such as canning. For specific comparisons, see Tables 2 and 3

Table 2. Thiamin retention comparison

Meat		
Percent in canned sample		Percent in irradiated sample
Beef	21	44
Chicken	22	66
Pork	12	57

Reference: *Journal of Food Science* 46:8, 1981.

Where can I get more information?

For answers to questions about food irradiation or other food safety concerns, contact your local county extension office.

References

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Table 3. Vitamin content comparison of cooked chicken

Amounts are for 2.2 pounds (1 kilogram) cooked chicken.

Vitamin	Non-irradiated sample	Irradiated sample
Vitamin A, international units	2200	2450
Vitamin E, milligrams	3.3	2.15
Thiamin, milligrams	0.58	0.42
Riboflavin, milligrams	2.10	2.25
Niacin, milligrams	58.0	55.5
Vitamin B6, milligrams	1.22	1.35
Vitamin B12, milligrams	21	28
Pantothenic acid, milligrams	13	17
Folacin, milligrams	0.23	0.18

Reference: *Journal of Food Processing and Preservation* 2:229, 1978

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The Food Marketing Institute released the following information as to which foods are cleared for irradiation:

Which foods have been approved for irradiation?

The US government has approved irradiation of the following foods:

- Refrigerated or frozen uncooked (red) meat, including ground beef

(1999) — to eliminate potential foodborne pathogens, such as *E. Coli* O157:H7 and *Salmonella*, and to extend shelf life.

- Poultry feed (1995) — to eliminate *Salmonella*.
- Fresh or frozen packaged poultry (1990, 1992) — to control *Salmonella*, *Campylobacter* and other illness-causing bacteria.
- Fresh fruits, vegetables and grains (1986) — to control insects and inhibit growth, ripening and sprouting.
- Pork (1985) — to control the parasite *Trichinella spiralis*, which causes trichinosis.
- Herbs, spices and vegetable seasonings (1983-1986) — to kill insects and control microorganisms.
- Dry or dehydrated enzyme preparations (1985) — to control insects and microorganisms.
- White potatoes (1964) — to inhibit sprout development.
- Wheat and wheat flour (1963) — to control insects.

FMI has also explained that consumers are more tolerant of irradiated foods they said in February of 2000 that surveys indicate that about one in seven reject irradiation for safety, nutrition or other reasons. The rest are either uninformed about the process or unaware of its benefits. A 1993 Gallup survey sponsored by the American Meat Institute found that

consumers grow more receptive when informed of the benefits and endorsements from health organizations: over half (54 percent) said they are likely to purchase irradiated meat, and 60 percent would be willing to pay a 5 percent premium for irradiated hamburger. In a USDA survey, two-thirds of the consumers interviewed said that would spend 17 cents more per pound for irradiated chicken, while 14 percent would never buy the product.

In a 1993 simulated supermarket study by the University of Georgia, 50 percent of the consumers tested chose irradiated over regular ground beef. After the consumers tested learned more about how irradiation affects raw meats, those choosing irradiated beef increased to 70 percent.

In a 1995 test by the Food Safety Consortium, 30 percent of the shoppers at two Iowa supermarkets paid a premium to buy irradiated poultry; 40 percent chose irradiated products when the price was the same as untreated poultry. The consortium, established

by Congress to research the safety of pork, beef and poultry, is made up of 80 researchers from Iowa State, Kansas State University and the University of Arkansas.

FMI surveys show that fewer consumers now regard irradiation as a serious health risk. The proportion holding this view declined from 43 percent in 1987 to 33 percent in 1997.

The majority of shoppers surveyed in FMI's 1999 *Trends* study said that they are very or somewhat likely to purchase irradiated poultry, pork or beef. Midwesterners are more likely to purchase irradiated meats and poultry (63 percent) than people in other parts of the country. More men than women find irradiated foods acceptable, as do those with some college education. Families with three or more people were more likely to purchase irradiated products.

As can be observed from the literature surrounding electronic pasteurization there is much to be considered and examined. The demand for constant production to fit the economies of scale for an electronic pasteurization plant in Nicaragua would have to be analyzed.

Summary

To summarize the findings of this report :

At the beginning of the project a visit was made to Mr. Renato Salazar, the president of the Nicaraguan American Chamber of Commerce to explore the history of exports from Nicaragua to the US. Mr. Salazar was very generous with his time and informed this writer that exports from Nicaragua with regard to perishable foodstuffs was limited. It is true that there are Nicaraguan stores and tienditas all over Miami, and all of the items normally associated with a Nicaraguan store are available. A large percentage of the items seen in stores do not move well. Many of the items are brought by Nicaraguans traveling to and from Managua. Mr. Salazar explained that the fritangas may be the only area that might generate enough volume to make an import deal interesting. He further intimated that many of the exporters that were exporting from Nicaragua are no longer working with perishables, but many have returned to basic grain production on their farms.

The single most limiting factor for exports from Nicaragua continues to be the lack of a viable maritime port. The increased cost of trucking all trailer exports over land from Nicaragua to Honduras or Costa Rica results in an automatic price disadvantage of more than thirty percent on just freight cost. Either items that are not produced in the US during Nicaraguan harvest such as sweet onions from Sebaco that enjoy strong market support in the US due to excellent quality and trust can be successful, or products like Nicaraguan cheese that can be air freighted show much opportunity.

There is a solution for the port situation. Until such time that the problem is solved, this one limiting factor will continue to affect every aspect of export business from Nicaragua, including manufacturing, textiles, as well as fruits and vegetables.

All the fresh fruits that could be exported with a electronic pasteurization process would still have the disadvantage of high inland freight costs.

All of the challenges faced by current exporters keep the number of Nicaraguan competitors low. There is a large body of evidence and history of entrepreneurs who have already tested the waters, and much wisdom reflected. Many of the members of APENN have invaluable advice in this regard. No new enterprise should ignore the advice and counsel available from those who have already learned.